

Durham Research Online

Deposited in DRO:

21 July 2016

Version of attached file:

Accepted Version

Peer-review status of attached file:

Peer-reviewed

Citation for published item:

Layton, R. and Rowley-Conwy, P. (2013) 'Wild things in the north? Hunter-gatherers and the tyranny of the colonial perspective.', *Anthropologie: international journal of human diversity and evolution.*, 51 (2). pp. 213-230.

Further information on publisher's website:

<http://puvodni.mzm.cz/Anthropologie/article.php?ID=1515>

Publisher's copyright statement:

Additional information:

Special Issue: Theory and method in the prehistoric archaeology of Central Europe.

Use policy

The full-text may be used and/or reproduced, and given to third parties in any format or medium, without prior permission or charge, for personal research or study, educational, or not-for-profit purposes provided that:

- a full bibliographic reference is made to the original source
- a [link](#) is made to the metadata record in DRO
- the full-text is not changed in any way

The full-text must not be sold in any format or medium without the formal permission of the copyright holders.

Please consult the [full DRO policy](#) for further details.

Wild things in the north? Hunter-gatherers and the tyranny of the colonial perspective

Robert Layton, Anthropology Department, University of Durham, UK
R.H.Layton@durham.ac.uk

Peter Rowley-Conwy, Archaeology Department, University of Durham UK
P.A.Rowley-Conwy@durham.ac.uk

Postal address (both authors)
Dawson Building,
Science Site,
University of Durham,
South Road, Durham DH1 3LE, U.K.

Abstract:

The paper argues for a synthesis of Darwinian and Marxist theories of evolution. We challenge claims that hunter-gatherer societies evolve via a natural progression from simple to complex, arguing instead that hunter-gatherer social strategies are adaptations to specifiable ecological conditions, while having emergent consequences that shape the political structure of hunter-gatherer society. We review the various theories of which we make use, and those that we challenge, and test them against data from the ethnographic and archaeological literature on hunter-gatherers, discussing the evidence for variation in technology, mobility, territoriality and egalitarianism versus social inequality. We conclude that human societies do not evolve via a natural progression from simple to complex forms, and that complex hunter-gatherers are not necessarily incipient farmers. Many of the assumptions that colour our views of the development of hunter-gatherer complexity and the appearance of agriculture in prehistoric Europe have their roots, consciously or unconsciously, in nineteenth-century European colonialism.

Keywords:

Hunter-gatherers, social evolution, research history, social complexity, origins of agriculture, Ertebølle, Mesolithic, Neolithic

Wild things in the north? Hunter-gatherers and the tyranny of the colonial perspective

Robert Layton and Peter Rowley-Conwy
University of Durham, U.K.

Introduction

In this paper we challenge an approach to the study of hunter-gatherer societies exemplified by the work of Price and Brown (1985) and J. Rousseau (2006), which is partially foreshadowed by Woodburn's seminal (1982) paper on 'immediate' and 'delayed return'. This approach, we argue, reflects a perspective on social interaction and change that has its roots in the colonizing culture of nineteenth-century, industrial Europe:

- Human societies evolve via a natural progression from simple to complex
- Complex societies are more sophisticated than simple ones
- People in simple societies want the things produced by complex societies

We compare two theories of evolution, Darwin's theory of natural selection and Marx's theory of the internal dynamic in the Capitalist mode of production. While theories of evolution as progress are generally incompatible with a Darwinian approach, we propose that the phenomenon of co-evolution in an ecological or social system offers a potential synthesis of the Marxist and Darwinian approaches, integrating the principle of the self-interested individual (for reproductive success, subsistence or profit) with the emergent properties of interaction. We take 'simple' and 'complex' hunter-gatherer societies as a test case for our approach. Are 'simple' hunter-gatherers fore-runners of 'complex' hunter-gatherers, related via a simple internal, one-way process of complexification? Are complex hunter-gatherer societies destined to become farmers? Do they wish to acquire what farming has to offer? Or, as we will argue, do 'simple' and 'complex' hunter-gatherers represent modes of social adaptation to different types of environment, with different emergent consequences for political organisation?

Theories of evolution and social change

Darwinian evolution

Darwin studied the variability created by the *artificial selection* practiced by dog breeders and pigeon fanciers, which showed how many varieties of a single species can be created by breeding from small variations that already exist. He appreciated that naturally occurring variants in the members of a species could be advantageous under changing conditions. He was alerted to the significance of variation in the wild by his famous study of finches on the Galapagos Islands, noting: "One might really fancy that, from an original paucity of birds in this archipelago, one species had been taken and modified for different ends" (Darwin 1901 [1845]: 384). Naturally occurring variability might be differentially selected in the wild because the environments on different islands colonised by an ancestral species of finch vary in, for example, the forms of available foods. Those individuals best shaped to take advantage of local foods will thrive and produce more offspring than others, when there is insufficient food for all.

In Darwin's figure from the same page as the above quotation, finch number 1 has a large beak for cracking seeds whereas finch number 4 has a narrow beak for catching insects. Boag and Grant (1984) found that on one of the Galapagos Islands two species of finch with different feeding habits responded differently to a drought in 1977, with different degrees of reproductive success.

The unit of selection in natural selection is the individual: Darwin was interested in competition for survival *between individuals of the same species*, because this is where competition for food is most intense. Variants that give even the slightest advantage in current natural conditions will tend to have greater reproductive success than others. Reproductive success is the key: 'survival' for Darwin is measured by the number of offspring an individual produces that survive long enough to reproduce in the next generation. Natural selection is more effective than artificial selection, but no adaptation is perfect.

Darwin could not explain co-operation, so adaptation in social behaviour was beyond the scope of his argument, although later researchers have explained social behaviour in Darwinian terms, as will be shown below.

Marx and progressive evolution

While the notion of evolution as progress – from simple to complex, from superstition to rationality – was pre-eminent in nineteenth century thinking, Marx differed from other 19th century evolutionists in identifying the mechanisms by which human social differentiation occurred. He followed Adam Smith in two respects, namely that humans are (1) unique in the ability to recognize rights and obligations created through the exchange of goods and services, and (2) in possessing a concept of ownership. Smith proposed that 'It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own self-interest' (Smith 1976 [1776]: 27). Marx expressed it rather differently: 'In the social production of their existence men inevitably enter into definite relations which are independent of their will' (Marx 1971 [1859]: 20-21). Adam Smith argued that self-interested market exchange generated universal opulence (Smith 1976 [1776]: 22), yet the Industrial Revolution had shown that the cosy relationship between us, the butcher, baker and brewer, was not the inevitable outcome of market exchange.

Marx set out to explain how the internal dynamic of industrial capitalism created ever increasing social inequity. He found the driving force of social instability in the capacity of human beings to produce, by their own labour, more than they needed to subsist. If this surplus labour can be controlled by someone else, it can be exploited to change society. Factories with machines can make goods more cheaply than independent craftsmen. The craftsmen who are driven out of work must find new work in the factories. If a craftsman needs to work six hours to earn his subsistence, but the capitalist [i.e. the factory owner] makes him work for eight before receiving his pay, the extra two hours labour earns the capitalist his profit. With this he can buy more labour, or more equipment for his workshop. It is a case of positive feedback or, in Marx's words, 'self-expanding value... a monster quick with life' (Marx 1930 [1867]: 189).

Co-evolution: a potential synthesis

The principle of co-evolution offers a potential synthesis of these theories, integrating the principle of the self-interested individual with the emergent properties of interaction. Darwin observed that ‘hive bees’ pollinate one species of clover, but ‘humble bees’ pollinate another. He deduced that each species of bee was visiting the species of clover in which the arrangement of stamens and pistils was most suited to the habits of that insect. Similarly, individuals in a species of bee with slight differences in the length or curvature of the proboscis might be able to obtain their food more efficiently than others. ‘Thus I can understand how a flower and a bee might slowly become, either simultaneously or one after another, modified and adapted to each other in the most perfect manner’ (Darwin 1886 [1859]: 75). If this example recalls Adam Smith and the butcher and the baker, the Red Queen hypothesis has a more Marxist flavour. The Red Queen hypothesis (van Valen 1973) models the co-evolution of predator and prey: in any generation, only the faster cheetahs will capture enough gazelles to feed their young, and only the faster gazelles will escape to raise their young. Over successive generations, the fastest cheetahs raise the most offspring, increasing the selective pressure on gazelles, and the fastest gazelles produce the most offspring, increasing selective pressure on cheetahs; the two species are caught in an ‘evolutionary arms race’. In biology, the types of interaction between individual pairs of species identified by Darwin and van Valen have been generalised in the concept of a ‘fitness landscape’; a complex system in which every organism and every population is a part of the environment exercising selective pressures on, and being influenced by, the other species that depend upon it (Kauffman: 1993: 181).

Game theory provided a comparable break-through in the study of social interaction. The aim of game theory is to show what will happen if particular social strategies are played against themselves and others, in order to measure the costs and benefits for the players. Maynard Smith termed the strategy that wins against itself and all other existing strategies being played in that field of interaction an evolutionarily stable strategy (Maynard Smith 1982: 10). Strategies may be evolutionarily stable in one environment, but not in another. In most hunter-gatherer societies, for example, a successful hunter shares his kill with the rest of the camp. Evolutionary anthropologists have devoted much research to investigating reasons why it might be adaptive for the hunter to give away part or all of his prey. Winterhalder (1987) devised a model to predict the consequences of hunter-gatherer food sharing. Imagine a hunter-gatherer band containing six hunters, who all go hunting independently. Each one is only successful one day out of six; but no-one knows when they will succeed. If the one who is successful shares his catch with the others each evening, every family will always have enough to eat. Among the Ache of South America, for example, a family of four could only make use of 50-60% of the calories provided by a single peccary before it spoiled (Kaplan et al. 1990: 114). Ethnographic studies show that a distinction is commonly made between plants and small game, which are not expected to be shared between households, and large game, which must be shared. Kaplan and Hill concluded ‘even above-average foragers may be willing to give more than their share in order to avoid the risk of [injury leading to] long stretches without food’ (Kaplan and Hill 1985: 237).

Two theories have been proposed to explain the evolution of co-operation among animals of the same species. Hamilton's (1964) theory of kin selection proposes that what is crucial is the survival of the gene(s) that promote co-operation. We share most genes with our closest relatives. If we sacrifice our resources or our lives to save a close relative, that relative will probably also have the gene (allele) that drove us make the sacrifice. Hamilton termed this phenomenon 'Inclusive Fitness'. His explanation is most applicable among social insects, where all the ants or bees in the colony are produced by the same queen, they will all be half siblings. Among humans, Trivers' (1985) theory of reciprocal altruism generally carries more weight, because it does not depend on close genetic kinship. Meat sharing among hunter-gatherers is a good example. Reciprocal altruism depends on mutual trust within a continuing social relationship. To succeed, reciprocal altruism depends on the ability to choose trustworthy partners, and punish those who cheat. Hunter-gatherer bands provide an ideal forum for this kind of interaction.

Malinowski and Functionalism

Social exchange among humans adds another level of complexity to the interaction that takes place between other species through symbiosis, predation or parasitism. Adam Smith and Karl Marx were well aware that the human capacity for exchange was unique, but the first ethnographic demonstration of its importance was Malinowski's study of the Kula exchange system in the Trobriand Islands of Melanesia (Malinowski 1922).

Malinowski set out to replace the speculative histories of 19th century evolutionism with a more empirical, scientific approach to the study of small-scale societies. In the absence of written histories or detailed archaeological evidence it was useless to speculate about the history of small-scale societies. Malinowski emphasised the stability of small-scale social systems and did not assume they represented temporary stages on the way to a centralised state (Malinowski 1922: 515-6). His aim was to show how different customs were functionally dependent on one another, which he did by tracing all the ramifications of inter-island exchange in the Western Pacific – the distinction between barter and gift exchange, the co-ordination of labour in canoe-building, the inheritance of property. Resembling Smith's butcher, baker and brewer, each island was able to specialise in the production of goods that made best use of local resources, including betel nut, wooden dishes, pots, stone axe blades etc. These were exchanged by barter during sea-going trading expeditions. But Malinowski undermined Smith's contention that barter was the earliest form of exchange, showing that the trust required to enable peaceful trade was created by the exchange of gifts with no commodity value between the leader of the expedition and the leader of the host village. He emphasised that the Trobriander was just as subject to social codes as a European, which overrode any 'natural acquisitive tendency' that might have been attributed to the archetypal primitive man living in a state of nature. Malinowski argued that culture 'consists in a more efficient and better founded way [than natural selection] of satisfying the innate biological desires of man' (Malinowski 1947: 33).

Simple and complex hunter-gatherers: a test case

In the remainder of the paper we look at the relationship between so-called 'simple' and 'complex' hunter-gatherer societies. Are the first fore-runners of the second,

related via a simple internal, one-way process of complexification? Are complex hunter-gatherer societies destined to become farmers? Or, as we will argue, do 'simple' and 'complex' hunter-gatherers represent modes of social adaptation to different types of environment? The Ertebølle, one of our two case studies, played a major role in 19th and early 20th century progressivist evolutionary theories, straddling the divide between eastern and western Europe. All these schemes had in common was that hunter-gatherers formed the first stage, the 'original human condition' from which all later developments sprang. Hunter-gatherers had in fact occupied this basal position in evolutionary schemes since the mid-eighteenth century 'Four Stage Theory' (Meek 1976, Barnard 2004). Placing all hunter-gatherers into a first stage of their own implied that they were a unitary type. But from the start, the Ertebølle has appeared somewhat anomalous among hunter-gatherers, making it the ideal case study for a consideration of the various evolutionary scenarios.

Price and Brown (1985) argue in favour of a theory of progressive evolution. They claim: 'Cultural complexity has arisen widely among hunter-gatherers, as part of 'a regular evolutionary process' (435). They cite four types of archaeological evidence for the process they term 'intensification'

- increasing technological specialization
- reduced mobility and larger settlements
- boundary defence of territories
- differentiation of social rank

Jerome Rousseau (2006) has more recently advanced a similar case. Rousseau argues that 'in simple human societies... members are trying to remain autonomous' (49), because 'it is onerous to be obliged to share the product of one's labour with others' (61). He identifies such 'simple' societies with what Woodburn (1980) termed 'immediate return', arguing that 'middle-range' societies emerge with the transformation from immediate to delayed return. Woodburn (1980, 1982) had used immediate and delayed return to classify hunter-gatherer societies into two types. Woodburn's typology provides a slightly more nuanced model than Price and Brown's, yet Woodburn also rejects any correlation between either type of society and particular ecological conditions. Rousseau (2006: 32) follows Woodburn, rejecting the hypothesis 'that alternative practices may differ in the survival advantage they provide' on the grounds that it cannot be tested.

Some of the social attributes of delayed return hunter-gatherers, such as food storage and ownership, territoriality, and social hierarchy, are shared with farmers. Hunter-gatherers cannot therefore be cast as a unitary social type fundamentally different from farmers: the difference is purely economic, the absence of domesticated species of animal and plant. Attempts to distinguish between Mesolithic and Neolithic 'modes of thought' (e.g. Barnard 2007) overlook hunter-gatherer variability and compare only immediate return hunter-gatherers with farmers. Another approach that admits hunter-gatherer variability while nevertheless adopting a rigidly progressivist stance is Hodder's distinction between *domus* and *agrios* hunter-gatherers: *domus* societies are characterised by sedentism, food storage and hierarchical society, while *agrios* ones have none of these attributes. In essence this recapitulates the distinctions made by Price and Brown, and Woodburn. Hodder argues that before any society can domesticate animals and plants, it must first domesticate itself, i.e. make the transfer

from *agrios* to *domus* (Hodder 1990: 38-41). In this scenario, *agrios* societies remain in a state of 'wildness', unable to change their food-gathering activities until they undergo a social change, to the next step on the ladder of complexity.

In the following section we propose an alternative explanation, exploring the extent to which hunter-gatherer complexity can be explained as an adaptation to specific ecological conditions

- Following Torrence (1983, 2001) we point out that complex technology is associated with highly seasonal environments in which hunting predominates over gathering. Animals are harder to catch, and available species change with the season (see Torrence 2001: figures 4.1 and 4.2).
- Territoriality is associated with environments in which resources are sufficiently densely and predictably distributed to repay the cost of defending them (among animals as well as humans – Davies and Houston 1984, Dyson-Hudson and Smith 1978).
- These two conditions are both satisfied in higher latitude temperate environments, and 'delayed return' therefore conflates at least two axes of variation (Layton 2005: 140): technology and territoriality.

Immediate return and delayed return as adaptations

Technology

Hunter-gatherer technology is subject to two conflicting adaptive pressures, precision versus flexibility. Precision demands that specific implements be designed to achieve particular tasks efficiently, while flexibility encourages multi-purpose tools that can exploit a wide range of more or less unexpected encounters. A related distinction was drawn by Binford (1979), between expedient and curated technology. A curated technology consists of tools prepared in advance, in anticipation of a specific event, which are stored when not in use, whereas an expedient technology comprises tools made when needed and abandoned after use. Optimal strategies are those that give the greatest return for least effort: in any ecological setting there will be 'trade-offs' between conflicting goals, such as design for specific tasks versus multi-functionality, tools made 'on the spot' and those carefully looked after. The optimal solution will depend on the local environment.

Aboriginal technology is as simple as that of hunter-gatherers in other semi-arid environments. In the Australian Western Desert, the traditional men's tool kit consists of a spear and spear thrower, the typical woman's kit a digging stick and carrying dish. The spear-thrower is a multipurpose tool, not only giving the hunter greater leverage when he projects his spear, but also providing an elongated carrying dish and, thanks to the stone blade mounted at one end, an adze for butchering meat or carving wooden implements. The digging stick can be used to extract edible roots, probe the sand for small animal burrows and clear waterholes of debris. Gould (1969) and Hayden (1979) noted that the stone choppers used in the Western Desert are sometimes made expediently when needed to fell trees or butcher kangaroo meat, and then left at the site. However, the tula adze blades of central Australia (called *kanti* in Pitjantjatjara) are made at the band's base camp, and only discarded when they are worn out. It goes without saying that the carefully crafted spears, spear-throwers and carrying dishes are also curated artefacts.

The Arctic Inuit have a complex technology and store food. The complexity of their technology is convincingly explained as a response to their high dependence on animal rather than plant foods, and the limited time periods when those prey species are available (Torrence 1983 and 2001). Inuit bands move to where each season's specific resources are found, and cache the equipment when they move onto the next location. Storage is both possible because of the cold climate and desirable because of the seasonal availability of food (Binford 1980).

Torrence (1983) coined the expression 'time stress' to convey the constraints affecting the efficiency of high latitude hunter-gatherer technology. Marlowe (2001) found that male hunting contributes from between 20-25% to 100% of the human hunter-gatherer diet. In high latitudes mobile, alert animal prey play an increasing part in the diet, while static plant foods decline in importance. Drawing on the previous work of Oswalt (1976), Torrence demonstrated her point by calculating the ratio of tools to weapons in a technological assemblage, and the number of component parts in each artefact, as a measure of their design for a specific purpose. Two of Torrence's examples (see the larger comparative tables in Torrence 1983, figures 3.1 and 3.2) dramatically illustrate the difference between low and high latitude tool kits.

	<i>weapons</i>	<i>instruments</i>
<i>Arrente</i> (Central Australia)	4 (21 parts)	4 (7 parts)
<i>Taremut</i> (Arctic)	18 (133 parts)	1 (3 parts)

These figures are probably under-estimates, but the difference is clear: consistent with the predominance of hunting over gathering, the Taremut not only have a higher number of weapons and (allegedly) fewer tools, but the weapons are considerably more complex. While Torrence's concept of 'time stress' implies that Australian Aborigines live in a less stressed environment than the Inuit, they are in fact subject to what can be called 'distance stress'. Hunter-gatherers living in a desert environment have to travel long-distances prepared for less predictable encounters with a wide range of species that are typically available all year round.

Mobility

The ability to move between bands is fundamental to human hunter-gatherer behaviour. Humans can generally move between bands within a regional community (see Layton and O'Hara 2010). Freedom of movement between band territories is typical of low-latitude hunter-gatherers, and was also found among the arctic Inuit. There was often much flexibility of movement within the named Inuit community and no descent groups claim prerogatives over particular parts of the community's territory (Gubser 1965: 166, Smith 1991: 113). Movement may serve several purposes. The band territory rarely enables self-sufficiency in subsistence resources. 'Aborigines, and most other hunter-gatherers, live in environments subject to great fluctuations in the weather and in the abundance of game and plant resources' (Peterson and Long 1986: 143). When water fails at one waterhole, during drought, people can join relatives or exchange-partners at other waterholes (see Layton 1986:

26, 34-5 and Myers 1986: 183 on the Australian Western Desert). In the Kalahari, drought occurs two out of five years and is severe in one year out of four, but rainfall can vary by a factor of ten over a few miles (Lee 1979: 352). Mutual insurance against local drought was one of the main reasons for maintaining inter-band links among the G/wi (Silberbauer 1981: 459). There are other reasons to value inter-band links. Woodburn (1982) argued that the desire to avoid disputes and overbearing would-be leaders were the main reasons for movement between bands among the Hadza. Turnbull and Abruzzi reach the same conclusion with regard to movement between Mbuti bands (Turnbull 1965: 106, 223, Abruzzi 1980). Equalising band size may be an underlying consideration. A newly-married Mbuti couple's residence is usually based on the relative size of the spouses' home bands (Turnbull 1965: 219). There are echoes here of Marx's 'Primitive Communalism' but, rather than supporting the concept of an 'original human condition', the evidence points to egalitarianism as the outcome of social strategies that are adaptive in particular ecological conditions.

Boundary defence of territories

Claiming exclusive access over territories is most profitable when resources are densely and evenly distributed, but in sufficiently short supply to make it worthwhile competing for them (Dyson-Hudson and Smith 1978, Gould 1982). Among recent hunter-gatherers boundary defence was most emphatically practiced on the Northwest Coast of North America. Boas quoted a Kwakiutl instructor who told him, 'The hunters of the different *numayms* [descent groups] cannot go hunting on the hunting grounds of the hunters of another *numaym*; for all the hunters own their hunting grounds, and when a hunter sees that another hunter goes to hunt on his hunting ground, then they fight, and generally one or both are killed' (Boas 1966: 35). The winter village contained several lineages that came together for mutual defence (Boas 1966: 35-36, Drucker 1965: 47, Hunn 1986: 33-4). Drucker describes the Northwest Coast winter village as an alliance of local groups whose territories were contiguous, and calls village communities 'tribes' (Drucker 1965: 70, compare Boas 1966: 37).

Some of the most interesting studies of hunter-gatherer territoriality show how territoriality varies among related groups according to latitude and resource (Andrews 1996, Renouf 1991: 91-94, Richardson 1986). As resources become more unpredictable, it becomes increasingly less certain that the individual or group will be repaid for defending the territory and defence eventually becomes uneconomic. As resources become more scarce, an increasingly large territory would be needed to guarantee self-sufficiency. This constraint arises in both semi-arid and arctic environments. The costs of patrolling its boundary would therefore increase until eventually they outweighed the benefits. Peterson and Long calculate that, even in the rich tropical woodland of northern Australia when the Yolgnu ('Murngin') live, an Aboriginal band of 40 occupying a territory of 400 km² would have had to defend a boundary of 70 km, equivalent to 2 km for every man, woman and child. Boundary defence is therefore not practised anywhere in Australia (Peterson and Long 1986: 29). Cashdan was the first to point out that low-latitude hunter-gatherers generally adapt to this constraint by allowing the kind of inter-access described by Lee, Turnbull and others rather than abandoning territoriality altogether (Cashdan 1983). Peterson (1975) and Cashdan called this 'social boundary defence', that is, defending access to the social group that holds the territory. Although it would be much too

time-consuming to patrol the boundary of a desert hunter-gatherer territory, it is impossible to enter without leaving footprints that will be found sooner or later by the resident group, so it is better to ask permission to join the group than risk punishment. Technological complexity among hunter-gatherers can be treated as an independent variable to defence of territories. Despite their complex technology Arctic Inuit society was traditionally egalitarian, like recent low-latitude hunter-gatherers. However, two features of hunter-gatherer mobility and social boundary defence generate equality, and it is here that a Marxist approach provides additional insight into the emergent social consequences of human adaptive strategies.

Egalitarianism versus hierarchy

Woodburn rightly regards the ability to change camps as a vital way of preventing the emergence of overbearing leaders, and therefore integral to the egalitarianism characteristic of 'immediate return' societies. Reciprocal exchange is supported by the egalitarian principle that surplus resources should be shared rather than hoarded. When all hunter-gatherer bands in a region suffer equally from uncertainty as to current resource distribution, and when the risk of local resource failure is unsynchronized, permitting mutual access to temporary abundances is a way of insuring against starvation. If one band's territory experiences better rainfall than neighbours, it will benefit the band to allow other bands to share its windfall, *providing* those bands in turn allow their former hosts to camp with them when the unpredictable sequence of rainfall favours them (Smith 1988, Winterhalter 1990: 67, Wiessner 1982). Other bands must ask permission before they share your resources, as this acknowledges the debt. Lee was told, 'It's when they eat alone and you come along later and you find them there [in your band's country], that's when the fight starts' (Lee 1979: 336; Turnbull 1965: 96 writes the same of the Mbuti). Axelrod's classic work on The Prisoner's Dilemma shows the adaptive value of this principle. In a 'game' where two players can most benefit from co-operation but cannot do so without building mutual trust, the most stable strategy is called 'tit-for-tat'. Player One begins by anticipating the other will co-operate and then, in subsequent moves, does what the other player did in their previous move. In this way other players who co-operate are rewarded, but those who 'defect' are punished. In the case of inter-band reciprocity, defection refers to those who refused to share, or who take without asking; these risk being excluded from future reciprocity. The cumulative benefits of co-operation are greater than those of always defecting. To rely on co-operation, the players must have evidence of the other's commitment to reciprocal altruism and must anticipate that mutual dependence will continue indefinitely into the future.

Rank and leadership were most strongly developed on the Northwest Coast. The potlatch was a form of exchange which developed among the hunter-gatherer societies of the Northwest coast of North America, in what is now Alaska and British Columbia (studies of the potlatch include Boas 1966, Drucker and Heizer 1967, Garfield and Wingert 1966 and Rosman and Ruebel 1971). Living in a predictable, seasonally-rich environment, these peoples were sedentary rather than nomadic. Small lineages owned hunting and berry-picking patches and fishing grounds at sea, which they defended against members of other lineages. Several lineages lived side by side in each winter village, providing between one and five hundred people to defend themselves against raids. The constituent lineages then dispersed to their respective

territories in spring, and began accumulating the food they would need to survive the lean months of winter, between November to February. Each lineage appointed a leader to co-ordinate its activities. Food was processed by smoking, drying or potting in fat, and stored for the winter. During the summer, lineages were thus able to accumulate surpluses of food obtained from their exclusive territories, which they then had the right to distribute through competitive inter-lineage feasting in the potlatch. Some surplus food was invested in feeding specialist craftsmen, who produced carved and painted wooden artefacts – boxes, spoons, hats, masks – emblazoned with the group's totemic images displayed at potlatches; and also objects such as woven blankets bearing designs that were not lineage specific, for distribution during potlatches. The quantity of valuables each lineage could give away demonstrated its wealth, and hence its rank.

The Northwest Coast potlatch was, during the time it was studied by anthropologists, a competitive institution. The wealth each lineage could accumulate depended on how many active members of the lineage there were, how many slaves they had working for them, and how effectively their activities were co-ordinated by the lineage head. He set goals for the lineage to achieve. The quantity of food provided at a potlatch and, more importantly, the scale of the gifts given away, expressed the lineage's economic position. The potlatch cemented alliances and advertised the lineage's power. The gifts distributed also expressed the rank of the recipients, since those with higher rank received bigger gifts. Poor lineages were vulnerable to attack; their land could be taken by the attackers and the members of the group enslaved. This historical trajectory resembles, in some respects, Marx's model of social differentiation in Capitalism.

Trajectories of complexity

Up to this point we have supported our argument with evidence of contemporary variation between hunter-gatherers living in different ecological settings. In the final section, we address evolution through time, taking two case studies, the Northwest Coast of North America and Mesolithic Denmark.

The Northwest Coast

The earliest indisputable evidence of human settlement on the Northwest Coast dates to between 9000 BC and 7800 BC (Ames and Maschner 1999: 84). Post-glacial sea levels rose rapidly until 8000 BC, sometimes peaking above modern level. During the early Archaic Period (10,500 BC – 4400 BC), unstable sea levels prevented the development of dense, predictable food resources. Archaic period technology was flexible and there is no evidence of specialised maritime hunting. Storage may have been practiced on a small scale.

By the start of the Pacific Period (4400 BC), sea levels had generally reached their modern position. Productive littoral environments appeared, and coastal rainforest started to develop. The beginning of Pacific Period is marked by appearance of large shell middens, probably associated with the greater sedentism and increased food production. There was a proliferation of tool forms, including harpoon heads. Cemeteries were clearly present by 2500 BC with some evidence from 3400 BC. The

first evidence for conflict on the Northwest Coast occurs by 3000 BC and is seen primarily in non-lethal skeletal injuries.

Plank houses, indicating sedentism, are found from early in the Middle Pacific Period (1800 BC to AD 200/500). Even greater technological complexity is seen in the making of nets, fish weirs and compound harpoons. There is a new emphasis on storage, with the wooden boxes used for food storage in historic times first seen in burials from 1900 BC (Ames and Maschner 1999: 140). Skeletons from the Northern Coast, inhabited in historic times by the Tsimshian, Tlingit and Haida, record a sharp upsurge in hand-to-hand fighting, with 48% of skeletons showing some injury.

Maschner (1997) dates the origin of Northwest coast warfare to the period between AD 200 and AD 500. Burials from this period in Tsimshian country indicate marked social inequality and intense levels of warfare or raiding associated with a decline in population. On the Northern Coast defensive sites appear during the Late Pacific period (AD 200/500 to c. AD 1775), where there is also evidence for emergence of large, multi-kin-group villages and larger than normal houses, presumed to be those of chiefs. The historic system of ranking had emerged by AD 1000. The bow and arrow were introduced to the region at that time, intensifying the violence of conflict. 'The wars that did result in changes in territory, at least in every recorded case, were the result of expansionist activities by the most populous and strongest group in a region, and the group that had the greatest amount of subsistence resources in their own territory' (Maschner 1997: 292). Those with least territory had neither the wealth nor the numbers to undertake a successful attack.

An adaptive approach to the Ertebølle

Hunter-gatherers termed 'Ertebølle' in southern Scandinavia, and 'Swifterbant' in the Low Countries, lived to the north of Linearbandkeramik and Rössen farmers. The boundary between them remained static for some 1500 years (fig. 4).

Early research took a stadial approach to the Ertebølle. Gordon Childe (1925, 15-17) regarded Ertebølle ceramics as a borrowing from more advanced farming societies, with the implication that hunter-gatherers were not likely to develop this technology for themselves. This continued through much of the twentieth century: the pottery and a few claimed domestic animals (see below) led Schwabedissen (1981) to argue that the Ertebølle should be termed Neolithic rather than Mesolithic, and the contemporary Narva hunter-gatherer culture of the SE Baltic continues to be referred to as Neolithic. The claims for domestic animals (listed in table 1) are all dubious (Rowley-Conwy 2013), and recent work has in any case severed the connection between ceramics and agriculture. Numerous Eurasian hunter-gatherer cultures have used pottery (Gronenborn 2010). The earliest pottery currently known was used by hunter-gatherers at Xianrendong Cave in China, around 20,000 years ago (Wu et al. 2012). For over half the time that ceramic containers have existed on earth, they have therefore been made and used by hunter-gatherers. Ertebølle pottery was in fact copied not from that of farmers to the south, but derives from a widespread North Eurasian hunter-gatherer tradition (Hallgren 2004, 2009).

As the stadial perspective faded, it was replaced by a more adaptive approach to the Ertebølle. Ertebølle socio-economic complexity was triggered by the appearance of marine resources. While the development of complexity on the Northwest Coast of North America took some 5000 years, in Mesolithic Denmark, complexity in hunter-gatherer technology and social organisation began virtually immediately after the stabilisation of the sea level. The following approach to the Ertebølle stresses neither stadial advance towards complexity, nor a desire to imitate farmers and acquire their goods. Rather, it considers Ertebølle social and economic behaviours in the context of the natural environment. Specifically, the question here is whether the Ertebølle was organised as an Immediate Return or a Delayed Return adaptation, using those terms as discussed above. We argue here that the Ertebølle was a delayed return economy. We will consider four major attributes that normally characterise delayed return societies, while recognising that the archaeological record only permits their partial examination: (a) semi-permanent or all-year settlement occupation; (b) food storage; (c) ownership of territories by individuals or groups; and (d) a degree of social hierarchy.

(a) *Semi-permanent or all-year settlement occupation* is demonstrated for the major Ertebølle settlements (e.g. Andersen 2007, Larsson 1990, Rowley-Conwy 1983). Overlapping resource availability within a limited area was what lay behind this: people did not need to migrate to new settlements in different seasons; rather the productive marine environment brought the resources close to the main settlements. The major settlement at Tågerup on the Swedish side of the Øresund has produced several major residential structures of both Ertebølle, and also Kongemose (= Middle Mesolithic) date (Karsten and Knarrström 2003). The permanency of these dwellings, and the multi-seasonal spectrum of resources exploited, make Tågerup a probable permanent settlement. Further east, the settlement of Skateholm on Sweden's southern coast lies further from the productive waters of the North Sea. This settlement may not have been occupied all year – indicators of summer occupation are lacking – but it was probably occupied for at least six months from winter to spring (Rowley-Conwy 1998b).

(b) *Food storage* is difficult to demonstrate in the archaeological record. However, the Ertebølle did rely heavily on the capture of small fish. These include eel, various species of the cod family, freshwater cyprinids, and flatfish such as plaice and flounder. The full importance of these small fish has only emerged as a result of large scale fine sieving of archaeological deposits (Enghoff 1994, 2011). Very large traps were used to capture these fish. The submarine example at Nekselø is at least 100 metres in length (Pedersen, 1995, 81). Many hazel stakes from fishtraps were found at Tågerup (Karsten and Knarrström 2003). Storable resources were thus being obtained in quantity; storage is therefore highly likely.

(c) *Territorial ownership* is a feature of hunter-gatherers in areas where resources are both dense and predictable (Dyson-Hudson and Smith 1978): density means the resource is likely to be important to human exploiters, while predictability makes investment in major installations like fishtraps worthwhile. The “Saxe-Goldstein hypothesis” states that hunter-gatherers may express territoriality by burying their dead in cemeteries, something nomadic and non-territorial groups never do. All the

recent hunter-gatherer groups recorded as burying their dead in cemeteries were also territorial (Saxe 1971, Goldstein 1981, Elder 2010). Major Ertebølle cemeteries at Vedbæk in Denmark (Albrethsen and Brinch-Petersen 1976) and Skateholm in Sweden (Larsson 1988) suggest strongly that the Ertebølle was indeed territorial.

(d) *A degree of social hierarchy* is likely in the Ertebølle, but very hard to demonstrate archaeologically. The argument is mostly based on recent hunter-gatherer societies that store food and own territories. Stores of food, and valuable resource points, are usually owned by the senior members of lineages, who thus acquire a higher social status (Keeley 1988).

These indications, problematic though they are, suggest that the Ertebølle practiced a delayed return economy. We suggest that this is due to the nature of the Ertebølle environment. In the Early Mesolithic, before 8000 cal BC, sea level was much lower than it is today, so Denmark was part of the continental European landmass (fig. 5 bottom). The overlapping, largely marine, resources that encouraged a delayed return response were largely absent. Not surprisingly, there is little evidence for delayed return behaviour at this time. But as sea level rose, the highly productive marine resources spread into the area (figure 3, top) encouraging delayed return-type behaviour.

The crucial point is that the sea began spreading into the region during the Middle Mesolithic, *before* the LBK farmers appeared to the south. The first delayed return behaviours also appear at this time (see discussion in Rowley-Conwy 2001). We must therefore attribute the Ertebølle delayed return adaptation to the nature of the local resource base, not to the presence of farmers far to the south.

Delayed return hunter-gatherers in coastal regions usually have quite high population densities (Keeley 1988, Layton and O'Hara 2010, table 5.1). This allows us to reinterpret the evidence of specialisation on animals providing skins, furs and feathers (figure 4) (Rowley-Conwy 1998a). This need no longer be seen as the outcome of a desire to supply 'forest products' to the farmers in return for stone adzes. There is no reason why these items should not simply be for the hunter-gatherers' own use.

The colonial perspective?

The Ertebølle as peripheral clients of the farmers

In recent years, the Ertebølle has been cast as peripheral hunter-gatherers, existing in the forests around the farmers in the core area. This core-periphery scenario sees the hunter-gatherers supplying the farmers with 'forest products' such as furs and honey, in return for farmers' artefacts such as polished axes, which held high symbolic value among the hunter-gatherers on account of their exotic origin among technologically superior people. Competition for these exotic products brought about social change and ultimately precipitated the appearance of agriculture (e.g. Fischer 1982, Klassen 2002, Verhart 2000, Zvelebil 1998). Some items of the farmers' technology were certainly being acquired by the hunter-gatherers: figure 4 plots the distribution of LBK and Rössen ground adzes north of the farming zone, and also Ertebølle sites with specialisation on fur- skin- or feather-bearing animals (see table 1 for details of the individual sites).

In the following we argue that recent European encounters with hunter-gatherers have played too great a part in the creation of this view (Rowley-Conwy in press). It is uncertain how competitive the Northwest Coast system was before the arrival of European traders, but it is clear that the fur trade exacerbated its competitiveness. Russian and English traders (the latter working through the Hudson Bay Company) bought pelts from the native Americans in exchange for woollen blankets, guns, traps and other goods. The enormous influx of wealth unbalanced the ranking of chiefs and lineages and, even more destructively, introduced diseases killed many people. Among the Kwakiutl, elaborately decorated blankets formed the principle item of exchange. Realising the value of blankets, the Hudson Bay Company imported hundreds of thousands from the factories of the English Midlands, resulting in runaway inflation in the value of blankets exchanged at potlatches. Some Kwakiutl then destroyed all their property in an attempt to achieve the ultimate competitive challenge. Late in the nineteenth century the governments of the United States and Canada made the potlatch illegal. When it was reintroduced in the 1950s, inter-lineage competition played a less important role than the display of cultural survival designed to cement unity among indigenous communities who now formed an ethnic minority within the nation state.

Does this provide an ethnographic parallel for the relationship between the Ertebølle and the LBK farmers? We argue this is not the case. In colonial times, competition for steel axes and knives was acute among stone-using hunter-gatherers. Visiting Tierra del Fuego on the *Beagle*, Charles Darwin (1860[1962, 206-207]) noted that the natives begged or stole them whenever they could. In early colonial Australia, steel axes were traded far ahead of the limits of British penetration and were much sought after (Reynolds 1981). In 18th century Labrador, Kaplan (1985) states that Inuit traded or stole whatever they could by way of metal tools. But the LBK and Rössen did not have steel axes, they had ground stone ones – and Ertebølle hunter-gatherers had ground stone axes as well. There is no reason to suppose that the Ertebølle suffered from a Stone Age equivalent of ‘metal envy’, or that they necessarily accorded the Rössen stone adzes any kind of symbolic value at all. Most of the adzes are surface finds lacking any archaeological context (Klassen 2002, Verhart 2012).

What the Rössen-Ertebølle trade might have been like in perishable organic goods we can only guess at. In recent colonial encounters, cheap beads and mass-produced coloured cloth were major trade items, and Europeans everywhere sought to sell these for extortionate quantities of whatever desirable commodities the local people had. But the LBK and Rössen farmers probably did not have a lot of cloth to sell: although they kept sheep and cultivated linseed, woolly sheep and linen cloth had not yet been developed. There is similarly little sign of trade in beads or such items. Bogucki (2008) has in fact argued that decorated bone objects might have been traded from the hunter-gatherers to the farmers, acquiring symbolic value only among the latter.

The LBK was far from an industrial culture! Archaeologists have tended to ascribe ‘symbolic’ value to Neolithic axes found on Ertebølle sites, but never to Mesolithic items found on LBK sites, yet Mesolithic microliths are quite frequent on Early Neolithic sites. The Ertebølle made their own axes. No imported axes have been

found in any ‘special’ context. Did the Ertebølle people even know they were exotic? What might the farmers have that the foragers wanted? Why desire domestic animals and crops when there were wild animals a-plenty? How would a couple of domestic cattle be incorporated into a hunter-gatherer way of life (Rowley-Conwy 2013)? Moreover, the case of the ‘Pitted Ware’ culture in southern Scandinavia between 3200-2400 BC demonstrates a southward re-advance of hunter-gatherers during a period when the climate became less suited to farming (Welinder 1971, Bramanti et al 2009). Marine resources become more productive, and subsistence reverted to a reliance on marine fish, seals, and wild boar. Hunter gatherers moved their settlements back to the coasts and farmers retreated to Denmark and the extreme south of Sweden. The farmers had rather little the foragers wanted. There is no evidence that the Ertebølle were in a ‘client relationship’ with the LBK/Rössen farmers. Forager and farmer technologies were symmetrical: there is no anthropological analogue we can call upon for inspiration – we are *beyond the anthropological comfort zone*! Nor, it may be added, were the native peoples of the American Northwest Coast heading toward agriculture. The economy of British Columbia today is dominated by forestry and mining because little of the State is ecologically suited to farming.

The Ertebølle transition to agriculture

We have argued that competition for exotic goods exchanged from the farmers is not an adequate explanation for the appearance of agriculture in the Ertebølle area. The assumption that hunter-gatherers automatically desire farmers’ technology is in fact rooted unconsciously in the stadial assumption that farmers are more ‘advanced’ than hunter-gatherers.

This raises the question of what did cause the transition to farming in the Ertebølle area, after 1500 years of near-stasis (fig. 4). The transition increasingly appears as rapid and complete (Rowley-Conwy 2004, 2011, Hartz et al. 2007, Terberger et al. 2009). We cannot hope to give a comprehensive review here. Various explanations have been put forward other than stadial progression and competition for farmers’ goods. It has been suggested that the hunter-gatherer economy may have been hit by an ecological crisis at c. 4000 BC (e.g. Rowley-Conwy 1984). Such ecological explanations have however focussed on specific local factors, and are not broad enough to account for the fact that agriculture spread not just to the Ertebølle area at 4000 BC, but to a huge swathe of northern Europe extending from the Vistula to Ireland (see Schulting 2010). A migration of farmers from the south is reappearing on the agenda as a possible explanation. Genetic studies suggest that the Ertebølle population made a considerable contribution to the subsequent farming population (Soares et al. 2010), although there are also considerable signs of immigrants (Skoglund et al. 2012).

Why might farmers migrate north after a 1500 standstill? Schier (2009) has suggested that the invention of slash and burn cultivation by Rössen farmers who previously practiced small-scale garden cultivation might have permitted territorial expansion. This has been criticised by Gronenborn (2010, 568), and slash and burn cultivation is unlikely to have been practicable in European temperate deciduous forests (Rowley-Conwy 1981, 2003). It is possible that the LBK expansion was brought to a halt by a

demographic collapse (Shennan 2009), so the possibility that demographic recovery and expansion might have powered the next agricultural advance needs to be examined.

We have argued that neither stadial views of hunter-gatherer progress, nor the suggestion that hunter-gatherer demand for farmers' goods, can explain the spread of farming into northern Europe. This makes the spread of farming both more elusive and much more interesting than we have previously allowed; a massive area for future research.

References

- ABRUZZI, W.S., 1980: Flux among the Mbuti Pygmies of the Ituri Forest. In E.B. Ross (Ed.): *Beyond the myths of culture*. Pp. 3-31. Academic Press, New York: .
- ALBRETHSEN, S. E., BRINCH PETERSEN, E., 1976: Excavations of a Mesolithic cemetery at Vedbæk, Denmark. *Acta Archaeologica* 47: 1-28.
- AMES, K., H. MASCHNER, 1999: *Peoples of the Northwest Coast: their archaeology and prehistory*. Thames and Hudson, London.
- ANDERSEN, S. H., 2007: Shell middens ("køkkenmøddinger") in Danish prehistory as a reflection of the marine environment. In: N. Milner, O. E. Craig and G. N. Bailey (Ed.): *Shell Middens in Atlantic Europe*. Pp. 31-45. Oxbow, Oxford.
- ANDREWS, E., 1994: Territoriality and land use among the Akulmiut of Western Alaska. In E. Burch and L. Ellanna (Eds.): *Key issues in Hunter-gatherer Research*. Pp. 65-93. Berg, Oxford.
- BARNARD, A., 2004: Hunting-and-gathering society: an eighteenth-century Scottish invention. In A. Barnard (Ed.): *Hunter-Gatherers in History, Archaeology and Anthropology*. Pp. 31-43. Berg, Oxford.
- BARNARD, A., 2007: From Mesolithic to Neolithic modes of thought. In A. Whittle and V. Cummings (Eds.): *Going Over: the Mesolithic-Neolithic Transition in North-West Europe*. Pp. 5-19. The British Academy, London (Proceedings of the British Academy 144).
- BINFORD, L., 1979: Organisation and formation processes: looking at curated technologies. *Journal of Anthropological Research* 35: 255-273.
- BINFORD, L., 1980: Willow smoke and dogs' tails: hunter-gatherer settlement systems and archaeological site formation. *American Antiquity*, 45: 4-20.
- BOAG, P., GRANT, P., 1984: Darwin's finches (*Geospiza*) on Isla Daphne Major, Galapagos: breeding and feeding ecology in a climatically variable environment. *Ecological Monographs* 54, 4: 463-489.
- BOAS, F., (ed. H. Codere), 1966: *Kwakiutl ethnography*. University Press, Chicago.
- BOGUCKI, P., 2008: The Danubian-Baltic borderland: northern Poland in the fifth millennium BC. In: H. Fokkens, B. Coles, A. L. van Gijn, J. P. Kleijne, H. H. Ponjee and C. G. Slappendel (Ed.): *Between Foraging and Farming*. Pp. 51-65. Leiden University (Analecta Praehistorica Leidensia 40).
- BRAMANTI, B., THOMAS, M., HAAK, W., UNTERLAENDER, M., JORES, P. TAMBETS, K., ANTANAITIS-JACOBS, I., HAIDLE, N., JANKAUSKAS, R., KIND, C-J., LUETH, F., TERBERGER, T., HILLER, J., MATSUMURA, S.,

- FORSTER, P., BURGET, J., 2009: Genetic Discontinuity Between Local Hunter-Gatherers and Central Europe's First Farmers. *Science* 326: 137-140.
- CHILDE, V. G., 1925: *The Dawn of European Civilization*. Kegan Paul, London.
- DARWIN, C., 1901 [1845]: *A Naturalist's voyage round the World*. Murray, London.
- DARWIN, C., 1886 [1859]: *The origin of species by means of natural selection*. Murray, London.
- DARWIN, C., 1962[1860]: *The Voyage of the Beagle*. Doubleday, New York.
- DAVIES, N., HOUSTON, A., 1984: Territory economics. In: J. Krebs, N. Davies (Eds.): *Behavioural ecology: an evolutionary approach*. Pp. 148-169. Blackwell, Oxford.
- DRUCKER, P., 1965: *Cultures of the North Pacific coast*. Chandler, San Francisco.
- DRUCKER, P., HEIZER, R., 1967: *To make my name good*. University of California, Berkeley.
- DYSON-HUDSON, R., SMITH, E.A., 1978: Human territoriality: an ecological assessment. *American Anthropologist* 80: 21-41.
- ELDER, E., 2010: *A Comparison of the Late Pleistocene and Early Holocene Burials of North Africa and western Europe*. Archaeopress, Oxford (BAR International Series 2143).
- ENGHOFF, I. B., 1994: Fishing in Denmark during the Ertebølle period. *International Journal of Osteoarchaeology* 4: 65-96.
- ENGHOFF, I. B., 2011: *Regionality and Biotope Exploitation in Danish Ertebølle and Adjoining Periods*. Royal Danish Academy of Sciences and Letters, Copenhagen.
- FISCHER, A., 1982: Trade in Danubian shaft-hole axes and the introduction of Neolithic economy in Denmark. *Journal of Danish Archaeology* 1: 7-12.
- GARFIELD, V., WINGERT, P., 1966: *The Tsimshian Indians and their arts*. University of Washington, Seattle.
- GEHASSE, E. F., 1995: *Ecologisch-Archeologisch Onderzoek van het Neolithicum en de vroege Bronstijd in de Noordoostpolder met de Nadruk op Vindplaats P14*. University of Amsterdam (PhD thesis).
- GOLDSTEIN, L. 1981: One-dimensional archaeology and multi-dimensional people: spatial organisation and mortuary analysis. In: R. W. Chapman, I. Kinnes and K. Randsborg (Eds): *The archaeology of death*. Pp. 53-69. University Press, Cambridge.

- GOULD, R., 1969: *Yiwara: foragers of the Australian desert*. Collins, Glasgow.
- GOULD, R., 1982: To Have and Have not: the ecology of sharing among hunter-gatherers. In N. M. Williams and E. S. Hunn (Eds.): *Resource Managers: North American and Australian Hunter-gatherers*. Pp. 69-91. Australian Institute of Aboriginal Studies, Canberra.
- GRONENBORN, D., 2010: Fernkontakte aus dem nördlichen Europa während der Bandkeramischen Kultur. In: J. Suteková, P. Pavúk, P. Kalábková and B. Kovár (Eds.): *Panta Rhei. Studies in Chronology and Cultural Development of South-Eastern and Central Europe in earlier Prehistory presented to Juraj Pavúk on the Occasion of his 75. Birthday*. Pp. 561-574. Comenius University, Bratislava.
- GUBSER, N., 1965: *The Nunamiut Eskimos, hunters of caribou*. Yale University Press, New Haven
- HALLGREN, F., 2004: The introduction of ceramic technology around the Baltic Sea in the 6th millennium. In: H. Knutsson (Ed.): *Coast to Coast - Arrival: Results and Reflections*. Pp. 123-142. Department of Archaeology and Ancient History, Uppsala University (Coast to Coast book 10).
- HALLGREN, F., 2009: 'Tiny islands in a far sea' - on the seal hunters of Åland, and the northwestern limit in the spread of early pottery. In: P. Jordan and M. Zvelebil (Eds.): *Ceramics before Farming. The Dispersal of Pottery among Prehistoric Eurasian Hunter-Gatherers*. Pp. 375-393. Left Coast Press, Walnut Creek.
- HALLSTRÖM, A., 1984: Appendix II. Benfynden från Löddesborgboplatsen. In: K. Jennbert (Ed.): *Den Produktiva Gåvan. Tradition och Innovation i Sydsandinavien för omkring 5300 år sedan*. Pp. 182-200. Gleerup, Lund (Acta Archaeologica Lundensia, Series in 4°, 16).
- HAMILTON, W.D., 1964: The genetical evolution of social behaviour (I and II). *Journal of Theoretical Biology* 7: 1-52.
- HARTZ, S., LÜBKE, H., TERBERGER, T., 2007: From fish and seal to sheep and cattle: new research into the process of neolithisation in northern Germany. In A. Whittle and V. Cummings (Eds.): *Going Over: the Mesolithic-Neolithic Transition in North-West Europe*. Pp. 567-594. University Press, Oxford (Proceedings of the British Academy 144).
- HATTING, T., HOLM, E., ROSENlund, K., 1973: En pelsjægerboplads fra stenalderen. *Kaskelot* 10: 13-21.
- HAYDEN, B., 1979: *Palaeolithic reflections: lithic technology and ethnographic excavations among the Australian Aborigines*. Australian Institute of Aboriginal Studies, Canberra.
- HODDER, I., 1990: *The Domestication of Europe*. Blackwell, Oxford.

HUNN, E., 1986: Mobility as a factor limiting resource use in the Columbia Plateau of North America. In N. Williams, E. Hunn (Eds): *Resource managers: North American and Australian hunter-gatherers*. Pp. 17-43. Aboriginal Studies Press, Canberra.

KAPLAN, H. and HILL, K. 1985: Food Sharing among Ache Foragers: Tests of Explanatory Hypotheses. *Current Anthropology*, 26: 223-46.

KAPLAN, H., HILL, K. and HUTARDO, A.M., 1990: Risk, Foraging and Foodsharing among the Ache. In: E. Cashdan (Ed.): *Risk and Uncertainty in Tribal and Peasant Economies*. Pp. 107-43. Westview, Boulder.

KAPLAN, S., 1985: European goods and socio-economic change in early Labrador Inuit society. In: W. W. Fitzhugh (Ed.): *Cultures in Contact: the European Impact on Native Cultural Institutions in Eastern North America, A.D. 1000-1800*. Pp. 45-70. Smithsonian Institution, Washington.

KARSTEN, P., KNARRSTRÖM, B., 2003: *The Tågerup Excavations*. National Heritage Board, Lund.

KAUFFMAN, S., 1993: *The origins of order: self-organisation and selection in evolution*. University Press, Oxford.

KEELEY, L. H., 1988: Hunter-gatherer economic complexity and 'population pressure': a cross-cultural analysis. *Journal of Anthropological Archaeology* 7: 373-411.

KLASSEN, L., 2002: The Ertebølle Culture and Neolithic continental Europe. In: A. Fischer and K. Kristiansen (Eds.): *The Neolithisation of Denmark: 150 years of debate*. Pp. 303-317. J.R. Collis, Sheffield.

LARSSON, L., 1988: *The Skateholm Project I. Man and Environment*. Almqvist and Wiksell, Stockholm (Skrifter utgivna av Kungliga Humanistiska Vetenskapssamfundet i Lund 74).

LARSSON, L., 1990: The Mesolithic of southern Scandinavia. *Journal of World Prehistory* 4: 257-309.

LAYTON, R., 1986: *Uluru, an Aboriginal History of Ayers Rock*. Canberra, Aboriginal Studies Press.

LAYTON, R., 1997: *An introduction to theory in anthropology*. Cambridge, Cambridge University Press.

LAYTON, R., 2005: Are hunter-gatherer immediate return strategies adaptive? In T. Widlok, W. Tadesse (Eds.): *Property and equality, vol. 1: Ritualization, sharing, egalitarianism*. Pp. 130-150. Berghahn, New York.

- LAYTON, R. and O'HARA, S., 2010: Human social evolution: A comparison of hunter-gatherer and chimpanzee social organisation. In: R. Dunbar, C. Gamble, J. Gowlett (Eds): *Social Brain, Distributed Mind*. Proceedings of the British Academy, 158: 85-115.
- LEE, R.B., 1979: *The !Kung San: men, women and work in a foraging society*. University Press, Cambridge.
- LEPIKSAAR, J., 1982: Djurrester från den tidigatlantiska boplatsen vid Segebro nära Malmö i Skåne (Sydsverige). In: L. Larsson (Ed.): *Segebro. En Tidigatlantisk Boplats vid Sege Ås Myrning*. Pp. 105-128. Malmö Museum, Malmö (Malmöfund 4).
- MALINOWSKI, B., 1922: *Argonauts of the Western Pacific: an account of native enterprise and adventure in the archipelagoes of Melanesian New Guinea*. Routledge, London, .
- MALINOWSKI, B., 1947: *Freedom and civilisation*. Unwin, London, .
- MARLOWE, F., 2001: Male contribution to diet and female reproductive success among foragers. *Current Anthropology*, 42: 755-760.
- MARX, K., 1930 [1867]: *Capital (volume 1)*. Trans. E. and C. Paul. Dent, London.
- MARX, K. 1971 [1859]: *A contribution to the critique of political economy*. Trans S.W. Ryazanskaya. International, New York.
- MASCHNER, H. 1997: The evolution of Northwest Coast warfare. In: D. L. Martin and D. W. Frayer (Eds): *Troubled times: violence and warfare in the past*. Pp. 267-302. Gordon and Breach, Amsterdam.
- MAYNARD SMITH, J., 1982: *Evolution and the theory of games*. University Press, Cambridge.
- MEEK, R.L. 1976: *Social Science and the Ignoble Savage*. University Press, Cambridge.
- MØHL, U., 1978: Aggersund-bopladsen zoologisk belyst. Svanejagt som årsag til bosættelse? *Kuml* 1978: 57-76.
- MYERS, F., 1986: *Pintupi country, Pintupi self*. Washington: Smithsonian.
- NOBIS, G. 1975. Zur fauna des ellerbekzeitlichen Wohnplatzes Rosenhof in Ostholstein I. *Schriften des Naturwissenschaftlichen Vereins für Schleswig-Holstein* 45: 5-30.
- OSWALT, W., 1976: *An anthropological analysis of food-getting technology*. Wiley, New York.

- OVERSTEEGEN, J. F. S., VAN WIJNGAARDEN-BAKKER, L. H., MALIEPAARD, R., VAN KOLFSCHOTEN, T., 2001: Zoogdieren, vogels, reptielen. In: L. Louwe Kooijmans (Ed.): *Hardinxveld-Giessendam De Bruin: een kampplaats uit het Laat-Mesolithicum en het begin van de Swifterbant-cultuur (5500-4450 v. Chr.)*. Pp. 209-297. Rijksdienst voor het Oudheidkundig Bodemonderzoek, Amersfoort (Rapportage Archeologische Monumentenzorg 88).
- PEDERSEN, L., 1995: 7000 years of fishing: stationary fishing structures in the mesolithic and afterwards. In: A. Fischer (Ed.): *Man and Sea in the Mesolithic*. Pp. 75-86. Oxbow Books, Oxford (Oxbow Monograph 53).
- PETERSON, N. 1975: Hunter-gatherer territoriality: the perspective from Australia. *American Anthropologist* 77: 53-68.
- PETERSON, N. and LONG, J., 1986: *Australian territorial organisation* (Oceania monograph 30). University of Sydney Press, Sydney.
- PRICE, T., BROWN, J., 1985: *Prehistoric hunter-gatherers: the emergence of cultural complexity*. Academic Press, Orlando.
- RENOUF, P., 1991: Sedentary Hunter-gatherers: a Case for the Northern Coasts. In: S. A. Gregg (Ed.): *Between Bands and States*. Pp. 89-107. Southern Illinois University Center for Archaeological Investigations, Carbondale (Occasional Paper 9).
- REYNOLDS, H., 1981: *The Other Side of the Frontier. Aboriginal Resistance to the European Invasion of Australia*. James Cook University, Townsville.
- RICHARDSON, A., 1986: The control of productive resources on the Northwest Coast of North America. In: N. Williams and E. Hunn (Eds): *Resource managers: north american and australian hunter-gatherers*. Pp. 93-112. Aboriginal Studies Press, Canberra.
- RICHTER, J., NOE-NYGAARD, N., 2003: A Late Mesolithic hunting station at Agernæs, Fyn, Denmark. *Acta Archaeologica* 74: 1-64.
- ROBEERST, A., 1995: *De Neolithische fauna van de Donk het Kerkhof bij Brandwijk, Alblasserwaard*. Faculty of Archaeology, Leiden University (Internal report).
- ROSMAN, A., RUEBEL, P., 1971: *Feasting with mine enemy: rank and exchange among Northwest Coast societies*. Columbia University Press, New York.
- ROUSSEAU, J., 2006: *Rethinking social evolution: the perspective from middle-range societies*. McGill-Queen's University Press, Montreal
- ROWLEY-CONWY, P. 1980: *Continuity and Change in the Prehistoric Economies of Denmark, 3700 bc to 2300 bc*. PhD thesis, University of Cambridge.

ROWLEY-CONWY, P., 1981: Slash and burn in the temperate European neolithic. In: R. Mercer (Ed.) *Farming Practice in British Prehistory*. Pp. 85-96. University Press, Edinburgh.

ROWLEY-CONWY, P., 1983: Sedentary hunters: the Ertebølle example. In: G. N. Bailey (Ed.): *Hunter-Gatherer Economy in Prehistory*. Pp. 111-126. University Press, Cambridge.

ROWLEY-CONWY, P., 1984: The laziness of the short-distance hunter: the origins of agriculture in Denmark. *Journal of Anthropological Archaeology* 3: 300-324.

ROWLEY-CONWY, P., 1998a: Meat, furs and skins: mesolithic animal bones from Ringkloster, a seasonal hunting camp in Jutland. *Journal of Danish Archaeology* 12 (for 1994/95): 87-98.

ROWLEY-CONWY, P., 1998b: Cemeteries, seasonality and complexity in the Ertebølle of southern Scandinavia. In: M. Zvelebil, L. Domanska and R. Dennell (Eds.): *Harvesting the Sea, Farming the Forest: The Emergence of Neolithic Societies in the Baltic Region*. Pp. 193-202. Sheffield Academic Press, Sheffield.

ROWLEY-CONWY, P., 2001: Time, change and the archaeology of hunter-gatherers: how original is the 'Original Affluent Society'? In: C. Panter-Brick, R. Layton, P. Rowley-Conwy (Eds.): *Hunter-gatherers: an interdisciplinary perspective*. Pp. 39-72. University Press, Cambridge.

ROWLEY-CONWY, P., 2003: No fixed abode? Nomadism in the Northwest European neolithic. In: G. Burenhult and S. Westergaard (Eds.): *Stones and Bones. Formal disposal of the dead in Atlantic Europe during the Mesolithic-Neolithic interface 6000-3000 BC*. Pp. 115-144. Archaeopress, Oxford (British Archaeological Reports, International Series 1201).

ROWLEY-CONWY, P., 2004: How the west was lost. A reconsideration of agricultural origins in Britain, Ireland and southern Scandinavia. *Current Anthropology* 45 supplement: S83-113.

ROWLEY-CONWY, P., 2011: Westward Ho! The spread of agriculture from Central Europe to the Atlantic. *Current Anthropology* 52(S4): 431-451.

ROWLEY-CONWY, P., 2013: North of the frontier: early domestic animals in northern Europe. In: S. Colledge, J. Conolly, K. Dobney, K. Manning and S. Shennan (Eds.): *The Origins and Spread of Domestic Animals in Southwest Asia and Europe*. Pp. 283-311. Left Coast Press, Walnut Creek.

ROWLEY-CONWY, P., in press: Foragers and farmers in Mesolithic/Neolithic Europe, 5500-3900 cal BC: beyond the anthropological comfort zone. In: F. W. F. Foulds, H. C. Drinkall, A. R. Perri, D. T. G. Clinnick, J. W. P. Walker (Eds.): *Wild Things: Recent Advances in Palaeolithic and Mesolithic Research*. Oxbow Books, Oxford.

- SAXE, A., 1970: Social dimensions of mortuary practices in a Mesolithic population from Wadi Halfa, Sudan. In: J. A. Brown (Ed.): *Approaches to the social dimensions of mortuary practices*. Memoires of the Society for American Archaeology 25: 39-57.
- SCHIER, W., 2009: Extensiver Brandfeldbau und die Ausbreitung der neolithischen Wirtschaftsweise in Mitteleuropa und Südkandinavien am ende des 5. Jahrtausends v. Chr. *Praehistorische Zeitschrift* 84, 15-43.
- SCHULTING, R., 2010: Holocene environmental change and the Mesolithic-Neolithic transition in north-west Europe: revisiting two models. *Environmental Archaeology* 15: 160-172.
- SCHWABEDISSEN, H., 1981: Ertebölle/Ellerbek - Mesolithikum oder Neolithikum? In: B. Gramsch (Ed.): *Mesolithikum in Europa*. Pp. 129-142. Museums für Ur- und Frühgeschichte, Potsdam (Veröffentlichungen des Museums für Ur- und Frühgeschichte Potsdam 14/15).
- SHENNAN, S., 2009. Evolutionary demography and the population history of the European Early Neolithic. *Human Biology* 81: 339-355.
- SILBERBAUER, G., 1981: Hunter/gatherers of the central Kalahari. In: R.S.O. Harding and G. Teleki (Eds.): *Omnivorous primates*. Pp. 455-498. University Press, Columbia.
- SKAARUP, J., 1973: *Hesselø-Sølager. Jagdstationen der südkandinavischen Trichterbecherkultur*. Akademisk Forlag, Copenhagen.
- SKOGLUND, P., MALMSTRÖM, H., RAGHAVAN, M., STORÅ, J., HALL, P., WILLERSLEV, E., GILBERT, M.T.P., GÖTHERSTRÖM, A., JAKOBSSON, M., 2012: Origins and genetic legacy of Neolithic farmers and hunter-gatherers in Europe. *Science* 336: 466-469.
- SMITH, A., 1976 [1776]: *An enquiry into the nature and causes of the wealth of nations*. Clarendon, Oxford.
- SMITH, E.A., 1988: Risk and uncertainty in the "original affluent society": evolutionary ecology of resource-sharing and land tenure. In: T. Ingold, J. Woodburn, R. Riches (Eds): *Hunters and gatherers: history, evolution and social change*. Pp. pp. 222-251. Berg, Oxford.
- SMITH, E.A., 1991: *Inujjuamiut foraging strategies*. Aldine de Gruyter, New York.
- SOARES, P., ACHILLI, A., SEMINO, O., DAVIES, W., MACAULAY, V., BANDELT, H.-J., TORRONI, A., 2010: The archaeogenetics of Europe. *Current Biology* 20: 174-183.

- SØRENSEN, S. A., 2009: Lollikhuse, a site from the transitional phase between the Mesolithic and Neolithic in Denmark. In: S. B. McCartan, R. Schulting, G. Warren, P. Woodman (Ed.): *Mesolithic Horizons vol. II*. Pp. 541-547. Oxbow Books, Oxford.
- TEICHERT, L., 1989. Das Tierknochenmaterial der erteböllezeitlichen Fundorte von Ralswiek-Augustenhof und Lietzow-Buddelin, Kr. Rügen. *Veröffentlichungen des Museums für Ur und Frühgeschichte Potsdam* 23: 59-74.
- TERBERGER, T., HARTZ, S., KABACINSKI, J., 2009: Late hunter-gatherer and early farmer contacts in the southern Baltic - a discussion. In: H. Glørstad, C. Prescott (Eds.): *Neolithisation as if History mattered. Processes of Neolithisation in North-Western Europe*. Pp. 257-297. Bricoleur, Lindome.
- TORRENCE, R., 1983: Time budgeting and hunter-gatherer technology. In: G. Bailey (Ed.): *Hunter-gatherer economy in prehistory*. University Press, Cambridge.
- TORRENCE, R., 2001: Hunter-gatherer technology: macro- and micro-scale approaches. In: C. Panter-Brick, R. Layton, P. Rowley-Conwy (Eds.): *Hunter-gatherers: an interdisciplinary perspective*. Pp 73-98. University Press, Cambridge.
- TRIVERS, R., 1985: Social evolution. Menlo Park: Benjamin/Cummins.
- Turnbull, C.M., 1965: *Wayward servants: the two worlds of the African pygmies*. Greenwood, Westport, Conn.
- VALEN, L. van, 1973: A new evolutionary law. *Evolutionary Theory* 1: 1-30.
- VAN WIJNGAARDEN-BAKKER, J. H., CAVALLO, C., VAN KOLFSCHOTEN, T., MALIEPAARD, C. H., OVERSTEEGEN, J. F. S., 2001: Zoogdieren, vogels, reptielen. In: L. Louwe Kooijmans (Ed.): *Hardinxveld-Giessendam Polderweg. Een mesolithisch jachtkamp in het rivierengebied (5500-5000 v. Chr.)*. Pp. 181-242. Rijksdienst voor het Oudheidkundig Bodemonderzoek, Amersfoort (Rapportage Archeologische Monumentenzorg 83).
- VERHART, L., 2000: *Times Fade Away. The Neolithization of the Southern Netherlands in an Anthropological and Geographical Perspective*. Faculty of Archaeology, Leiden University (Archaeological Studies Leiden University).
- VERHART, L., 2012: Contact in stone: adzes, Keile and Spitzhauen in the Lower Rhine Basin. *Journal of Archaeology in the Low Countries* 4: 5-35.
- WELINDER, O., 1971: A Pitted Ware Culture Site in Eastern Sweden. *Meddelanden från Lunds Universitets Historiska Museum* 1969-1970: 5-98.
- WIESSNER, P., 1982: Risk, reciprocity and social influences on !Kung San economics. In: E. Leacock and R. Lee (Eds.): *Politics and history in band societies*. Pp. 61-84. University Press, Cambridge.

WINGE, H., 1903: Om jordfundne fugle fra Danmark. *Videnskabelig Meddelelser fra den Naturhistoriske Forening i Kjøbenhavn* 1903: 61-109.

WINTERHALDER, B., 1987: Diet choice, risk and food sharing in a stochastic environment. *Journal of Anthropological Archaeology* 5: 369-392.

WINTERHALDER, B., 1990: Open Field, Common Pot: Harvest Variability and Risk Avoidance in Agricultural and Foraging Societies. In: E. Cashdan (Ed.): *Risk and Uncertainty in Tribal and Peasant Economies*. Pp. 67-87. Westview, Boulder.

WOODBURN, J., 1980: Hunters and Gatherers Today and Reconstruction of the Past. In: E. Gellner (Ed.): *Soviet and Western Anthropology*. Pp. 95-117. Duckworth, London.

WOODBURN, J., 1982: Egalitarian societies. *Man* 17: 431-451.

WU, X., ZHANG, C., GOLDBERG, P., COHEN, D., PAN, Y., ARPIN, T., BAR-YOSEF, O., 2012: Early pottery at 20,000 years ago in Xianrendong Cave, China. *Science* 336: 1696-1700.

ZVELEBIL, M., 1998: Agricultural frontiers, Neolithic origins, and the transition to farming in the Baltic basin. In: M. Zvelebil, R. Dennell and L. Domanska (Eds.): *Harvesting the Sea, Farming the Forest: the Emergence of Neolithic Societies in the Baltic Region*. Pp. 9-27. Sheffield Academic Press, Sheffield (Sheffield Archaeological Monographs 10).

Table 1. Ertebølle and Swifterbant special purpose camps.

	site	N large mammals	specialisation	claimed domestics	reference
1	Hardingxveld G. Polderweg	1451	1527 beaver 1324 otter 422 duck	-	Van Wijngaarden-Bakker et al. 2001
2	Hardingxveld G. de Bruin 1-3	418	1219 beaver 613 otter	pigs, cattle, caprines	Oversteegen et al. 2001
3	Brandwijk-Kerkhof	151	63 otter 41 beaver	cattle, pigs, caprines	Robeerst 1995
4	Schokland P14 A	156	58 beaver	pigs, cattle	Gehasse 1995
5	Hüde I (Mesolithic)	-	-	cattle	Zvelebil 1998
6	Rosenhof	308	32 seal	cattle	Nobis 1975
7	Buddelin	118	88 seal	-	Teichert 1989
8	Tybrind Vig	729	658 pine marten 122 otter 102 wildcat	cattle	Zvelebil 1998
9	Agernæs	2062	1149 pine marten 1079 neonatal red deer (81%) 473 neonatal roe deer (61%)	-	Richter and Noe-Nygaard 2003
10	Ringkloster	4074	772 pine marten 189 newborn red deer (24%) 22 newborn roe deer (20%)	cattle	Rowley-Conwy 1998a, Zvelebil 1998
11	Lystrup Enge	1419	175 killer whale	-	Enghoff 2011
12	Vænge Sø II	120	29 seal 35 small whale	-	Rowley-Conwy 1980, Enghoff 2011
13	Vænge Sø III	286	84 cormorant 84 pine marten	-	Enghoff 2011
14	Hjerk Nor	308	40 otter 207 wildcat	-	Hatting et al. 1973
15	Ertebølle	427	89 duck 123 gulls	-	Enghoff 2011
16	Aggersund	161	257 swan 26 pine marten	-	Møhl 1978
17	Lolikhuse	2038	-	cattle	Enghoff 2011, Sørensen 2009
18	Sølager I	276	1276 birds, most swan and duck	-	Skaarup 1973, Winge 1903
19	Löddesborg	151	33 seal	cattle	Hallström 1984
20	Segebro	1845	392 seal	-	Lepiksaar 1982

Ringkloster: 612 adult/subadult red deer, 88 ad/subad roe deer

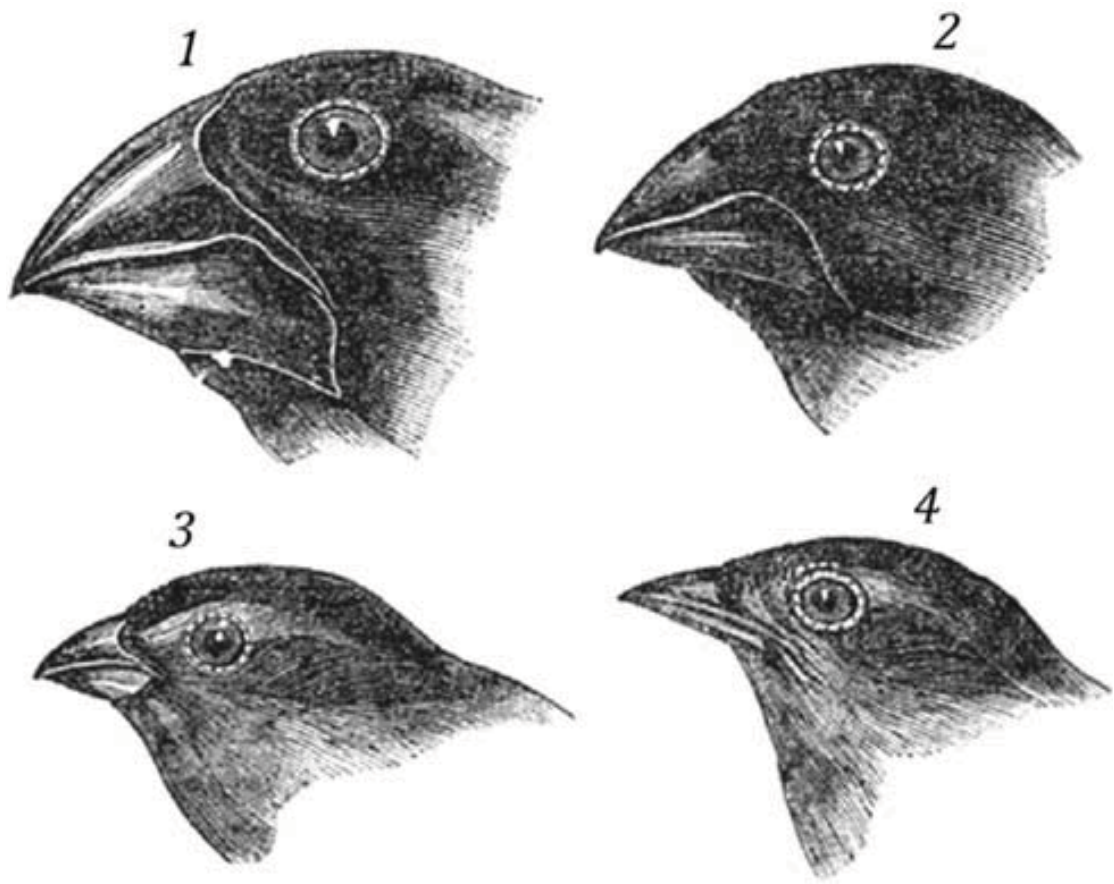


Figure 1. Darwin's sketch of the beaks of Galapagos Islands finches

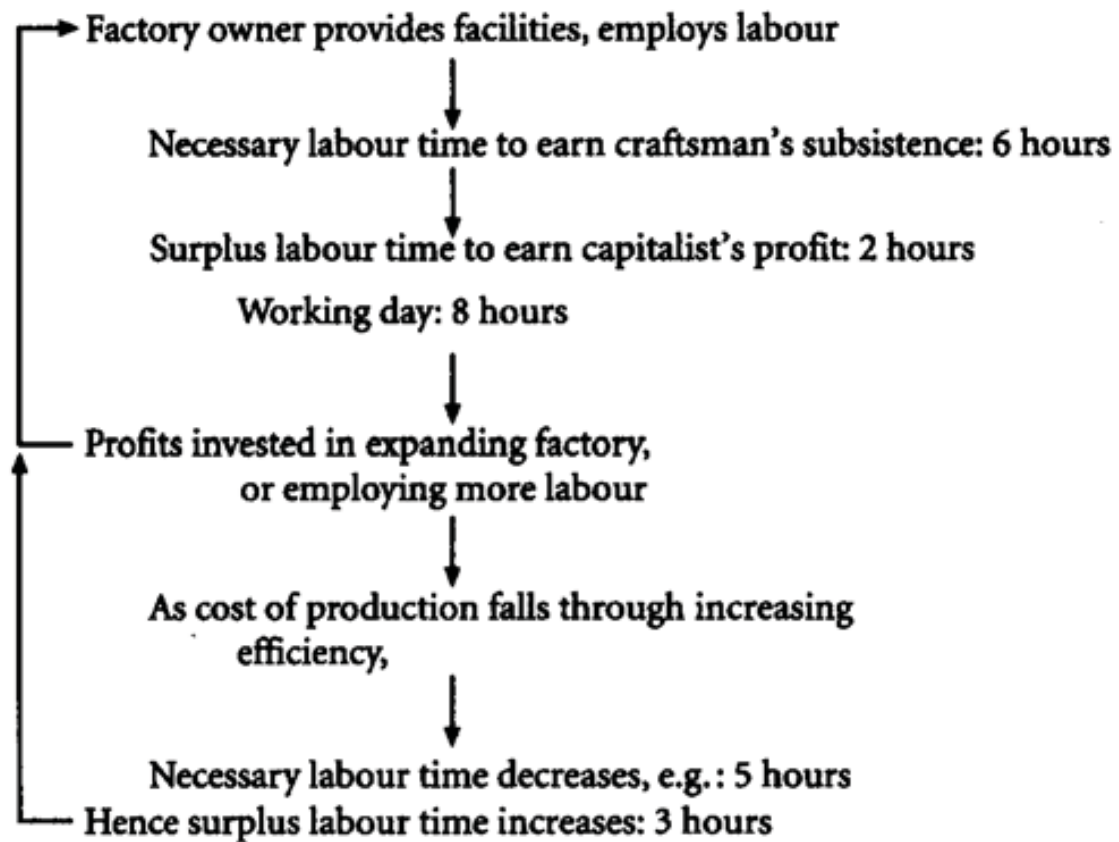


Figure 2. Representation of Marx's concept of feedback in Industrial Capitalist production. Adopted from Layton (1997: 12)

